



**BENEFITS TRANSFER OF CHILDREN'S HEALTH VALUES**

Marla Markowski

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U.S. Environmental Protection Agency  
National Center for Environmental Economics  
1200 Pennsylvania Avenue, NW (MC 1809)  
Washington, DC 20460  
<http://www.epa.gov/economics>

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Marla Markowski

Correspondence:

Marla Markowski  
Industrial Economics, Incorporated  
markowski@indecon.com

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## **BENEFITS TRANSFER OF CHILDREN'S HEALTH VALUES**

Marla Markowski<sup>1</sup>

**Abstract:** One of the many difficult issues the Environmental Protection Agency's Office of Children's Health Protection is addressing is the appropriate treatment of children's health effects in the economic analyses performed by the Agency. Policy analysis efforts at the Agency often rely on the benefits transfer technique, and very few of the Agency's benefit transfers have explicitly addressed children's health issues. To assist the Agency in its efforts, this paper discusses the benefits transfer technique as it applies to estimating values for children's health.

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63 Children's Health

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Children, Benefit Transfer

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## INTRODUCTION

EPA established the Office of Children's Health Protection (OCHP) in 1997 to support its efforts to increase the protection of children's health throughout its programs. One of the many difficult issues the Office is addressing is the appropriate treatment of children's health effects in the economic analyses performed by the Agency. Policy analysis efforts at the Agency often rely on the benefits transfer technique, and very few of the Agency's benefit transfers have explicitly addressed children's health issues. In addition, no accepted systematic process for conducting benefits transfer currently exists.

To assist the Agency in its efforts, this paper discusses the benefits transfer technique as it applies to estimating values for children's health. The first section provides some general background on the technique, and its application to estimate health-related values for children. The second section raises important issues to consider when conducting a benefits transfer for children's health values. The last section discusses the implications of using the benefits transfer method to estimate values for children's health. The scarcity and state of existing child-oriented health valuation literature suggests that it may be necessary to transfer adult-oriented values to estimate child-related values (Neumann and Greenwood 1999). However, as noted in Agee and Crocker (1999), several issues that play an important role in the economic valuation of health may differ between adults and children. Analysts should acknowledge that the differences in these determinants of value add imprecision to the transferred value estimates. The results of this paper suggest that transfer of these value estimates to children at best provides estimates for a scoping analysis. In cases where these scoping exercises indicate that children's health values may be a crucial component in the policy analysis, primary research should be undertaken to explore how health value determinants may differ between adults and children, and to estimate child-related values.

## BACKGROUND

Benefits transfer is an alternative to using primary research to value health effects. In benefits transfer, valuation information from one or more existing studies is used to assess benefits in a new policy setting.<sup>2</sup> In the case of valuing children's health, much of the existing research does not directly address child-related benefits. For this reason, it is important to explicitly consider the issues involved in transferring existing adult-oriented health value estimates to estimate values for child health effects.

Applications of benefits transfer to value children's health often have aimed to provide only rough approximations of the monetary benefits of avoiding adverse health effects. For example, EPA's retrospective cost-benefit analysis of the Clean Air Act (EPA 1997) estimates a range of benefits associated with changes in children's IQ using a number of adult wage-rate studies. In particular, the study estimates the value of neonatal mortality due to low birth weight caused by maternal exposure to lead. The study applies a value of statistical life estimate of \$4.8 million, calculated from 26 contingent valuation and wage-risk studies of adults, to estimated mortality changes.

In addition, EPA recently undertook an effort to present a set of "off-the-shelf" approaches from the existing literature and a discussion of the use of these approaches for application in analyses of environmental health risk reduction (EPA 1998). In this study, EPA assesses the practical issues related to valuing non-cancer (i.e., morbidity) health effects by discussing the methods for applying existing primary research through benefits transfer, including the key issues involved in applying this technique. EPA provides case studies that identify important issues to consider when estimating values, including case studies of childhood asthma and childhood lead poisoning. Several other studies have discussed benefits transfer and the issues that may arise as a result of employing this

technique for policy analysis; however, these studies do not specifically address the value of children's health effects.<sup>3</sup>

## **BENEFITS TRANSFER CONSIDERATIONS**

Because the number of existing child-specific value estimates is limited, transfers for estimating the value of children's health effects will likely involve values developed for adults. Because there are many aspects of children's health values that differ from those of adults (see Agee and Crocker 1999), transferring these values is not a straightforward process. Children's health values often reflect the values that adult caregivers have for children, and not values of the children themselves. Many of the determinants of value for children's health are different from those associated with adults, including: caregiver affection and empathy (i.e., altruism); parental motivations to obtain future care from their children; desire to maintain potential for future productivity of the child as an adult; public empathy; ability for caregivers to protect child health; and availability of community-supplied child health protection. As a result, critical considerations of children's health issues must enter into the following benefits transfer steps: describing the policy scenario for transfer, evaluating the appropriateness of the existing studies, and transferring the benefits to the policy case. Table 1 below summarizes the steps of the benefits transfer process and the important characteristics and determinants of value to consider when using adult-oriented values to estimate values for children's health. The remainder of this section discusses each of these considerations.

### **Policy Scenario**

The first step in conducting a benefits transfer is to carefully describe the policy case. The ability to identify relevant existing studies, assess their suitability for transfer, and conduct the

transfer first depends on an accurate and thorough description of how the policy will affect health and economic well-being. Such a description involves: (1) consideration of how the health effects of the policy are measured; (2) a thorough description of the characteristics of the health effect likely to influence willingness to pay (WTP) values; (3) a complete accounting of how a change in the health effect will affect well-being; and (4) a description of the population experiencing the change in the health effect. Several considerations specifically related to children arise in each step of this process of describing the policy case.

As a first step, it is important to consider the issues regarding the measurement of health effects of the policy, and how they might be different for children than for adults:

- Would people perceive the effect as adverse? Health scientists may measure effects that ordinary people might not notice or perceive as affecting their well-being. It is difficult or impossible to place a meaningful economic value on these effects. Health effects might be perceived as different for adults versus children. Caregivers may perceive health effects to be more (or less) benign for adults than for children.
- Does the measure reflect a health effect alone, such as an asthma attack, or a behavioral response as well, such as a day of work loss? Depending on the situation, this issue may not be different for children and adults. Caregivers still may have to miss work to care for a sick child, but the measure may not reflect effects that children experience (e.g., missed school).
- What is the degree of uncertainty in the health effect measurement? Generally, greater efforts at precision in benefit estimation are warranted when health effects are measured with greater precision. In cases where less (or more) is known about children's health effects than adults, this issue may differ from adults to children.

<p align="center"><b>Table 1</b></p> <p align="center"><b>BENEFITS TRANSFER STEPS</b></p> <p align="center"><u><b>Using Adult-Oriented Health Studies to Estimate Child Health Values</b></u></p>	
<b>BENEFITS TRANSFER STEP</b>	<b>SELECTED FACTORS TO CONSIDER</b>
<p><u><b>Step 1: Describe the Policy Case</b></u></p> <ul style="list-style-type: none"> <li>Health Effect Measurement</li> <li>Health Effect Characteristics</li> <li>Well-Being Impacts</li> <li>Population Characteristics</li> </ul>	<p>Perception of adversity; exclusion of child behavioral responses; certainty of measurement different from adults</p> <p>Certainty of occurrence; type of change; baseline health level; frequency; duration; severity; ease of avoidance; nature of health effect; latency</p> <p>Exclusion of: lost school time; caregiver disutility due to child pain and suffering; child's foregone future earnings; caregiver foregone earnings</p> <p>Age; health status; education level</p>
<p><u><b>Step 2: Study Suitability</b></u></p> <ul style="list-style-type: none"> <li>Study Quality</li> <li> <ul style="list-style-type: none"> <li><i>1. Cost of Illness</i></li> <li><i>2. Contingent Valuation</i></li> <li><i>3. Averted Behavior</i></li> </ul> </li> <li>Study Applicability</li> </ul>	<p>Depends on study method's ability to account for determinants of value, e.g., caregiver affection and empathy; parental future care motivations; future child productivity; public empathy; ability to protect child health; community-supplied child health protection</p> <p>Differences in: treatment; child-related costs; foregone earnings; length of illness</p> <p>Issues are with respect to study applicability</p> <p>Behavioral differences that depend on health effect, e.g., child safety seat, nutrition needs</p> <p>Differences in: policy and study cases; susceptibility to health impacts; severity levels</p>
<p><u><b>Step 3: Transferring Estimates</b></u></p> <ul style="list-style-type: none"> <li>Point Estimate Approach</li> <li>Benefit Function Transfer</li> <li>Meta Analysis</li> <li>Bayesian Analysis</li> </ul>	<p>Consider differences in: health effect measurement, health effect characteristics, well-being impacts/determinants of value, and population characteristics; need some understanding of child health values relative to those of adults</p>



As discussed in EPA's draft non-cancer valuation handbook (1998), a necessary precondition for matching the policy case to existing studies is to account for the characteristics of the health effect which influence WTP when describing the policy scenario. In any health-related benefits transfer, key characteristics include:

1. The certainty with which the health effect is likely to occur, or is at risk of occurring.
2. The baseline level and policy-induced change in the frequency, duration, severity or probability of the health effects.
3. The ability to easily avoid or relieve the health effect.
4. The nature of the health effect as occurring in isolation or with other symptoms.
5. The existence of a latency period associated with the health effect.

Although the importance of these characteristics will likely vary with the policy case, several may have more relevance for children than adults, thereby requiring different considerations during the benefits transfer. For example:

- The duration of the health effect may have a serious effect on children's health values (Moore and Viscusi 1988). Children have longer expected lives than their adult caregivers, and therefore may experience chronic health conditions that are longer in duration than what adults would experience. Health effect duration may also be important if the long duration of a health effect leads to significant and long-term indirect effects (e.g., educational impacts).
- Averting behavior may be more difficult to fully describe with children's versus adult health values. The caregiver may try to control the child's behavior in an effort to avoid or relieve a given health effect, and the child may or may not respond to this intervention. In addition, caregiver behavior or intervention may not accurately reflect child health values if the caregiver is unaware of the risks to the child's health or does not perceive the health risks accurately.
- The severity of a given health effect could be more or less significant for children, depending on the physical differences between adults and children. Some health effects may have a relatively mild effect on adults as compared with children, resulting in a more severe health condition for children than adults (e.g., lead exposure). Alternatively, some health effects

may have the opposite consequence. For example, liver toxicity from exposure to acetaminophen is more severe in adults than children (Kauffman, 1992).

- The delay from the time of exposure to the manifestation of the effect may have complex effects on health values for children. Caregivers may discount a child's future at a rate lower than that which they discount their own future because they do not wish to preclude opportunities for their children. For example, caregivers may de-lead their homes to prevent their child from suffering from impaired cognitive development, leading to lower IQ level and reduced educational attainment. In addition, caregivers concerns for delayed effects may reflect selfish considerations if they expect that their children would provide them with future care (i.e., the eventuality of children caring for their caregivers).

The next element of describing the policy scenario is to categorize the health-related impacts on children's well-being. For adults, several economic effects may arise from health decrements, including increased medical expenses, foregone earnings, losses in nonmarket production, lost leisure time, increased averting costs, and increased pain and suffering. These impacts may also occur relative to children's health effects. For example, caregivers may incur lost earnings because they are responsible for taking the child for medical care. Additional economic impacts may result from poor children's health, including lost school time, disutility a caregiver bears from the pain and suffering a child may endure, and children's foregone future earnings. Often it will not be possible to value all of these effects without primary research.

Finally, a complete description of the policy includes a portrayal of the affected population. This description typically focuses on personal characteristics likely to affect WTP, such as income, age, education, and health status. In some cases, the characteristics used in the adult health valuation context will be appropriate for transferring adult values to children. For example, in children's health valuation, characteristics such as education and income are likely to represent the caregiver's income and education level. These characteristics are appropriate for the child health valuation context because these adult characteristics may affect the degree and type of mitigation, the amount of information caregivers have concerning the health effect, and the accuracy of the caregivers' perceptions of the risks to the child. However, missing from the adult-oriented study could be characteristics such as education level or age of the child.

## **Study Suitability**

When applying the benefit transfer technique to value children's health effects, a necessary first step is to identify existing children's health studies or adult-oriented studies which may be relevant to the policy case. Using the description of the effects of the policy as a guide, the analyst can search the literature for high-quality studies that value a similar health effect in a similar population. In the case of children's health, however, analysts will be faced with the relative scarcity of relevant primary research. Current efforts describe the existing studies that provide estimates of children-oriented values related to mortality, childhood cancers, chronic effects, and acute effects, prenatal exposure effects, and reproductive effects (Dickie and Nestor 1998; Neumann and Greenwood 1999). These papers identify the relatively few (approximately 20) existing studies of child-oriented values that value a broad range of effects. Because the studies cover relatively little ground in comparison to the types of effects that may exist for children's health valuation, it may be more appropriate to transfer adult-oriented value estimates to estimate child-related values. As a result, the criteria for assessing study suitability must take this type of transfer into account.

Two major issues involved in reviewing the studies for suitability to the study case concern (1) the quality of existing studies, and (2) their applicability to the new policy situation. Quality refers to the defensibility of the research methodology employed, and the reliability and precision of the estimates obtained. Applicability refers to the match between the study case (the situation examined in the original study) and the policy case (the situation relevant to the new policy). A summary of general criteria for evaluating the transferability of existing studies discussed in the literature can be found in Desvousges, et. al (1998). Because child- and adult-oriented value determinants differ, the evaluation of the guidelines for assessing the quality and applicability of studies for children's health valuation may result in differing conclusions about the suitability of any given study for transfer.

## Study Quality

In benefits transfer, the guidelines for assessing study quality should include some assessment of whether the study employs “best research practices” for estimating health values (i.e., whether the study addresses the appropriate theoretical constructs necessary for valuing children’s health); has been peer-reviewed and is viewed favorably in the professional community; and provides results that compare with results in other studies or conform with expectations from theory. EPA’s *Guidelines for Economic Analysis* (draft, 11/8/98) provides information on assessing the quality of studies for benefits transfer. The *Guidelines* note that indicators of study quality will generally depend on the method used.

In Agee and Crocker’s discussion of the relative strengths and weaknesses of the methods to value children’s health benefits (1999), the authors state that a study is considered of high quality if it addresses determinants of value for children’s health. These determinants may include: the motivations caregivers may have for the demand and supply of children’s health; the context or setting in which the adults make decisions regarding children’s health; whether caregivers undertake private protection or other mitigating factors to protect children’s health; and if other important parameters, such as the caregiver and sibling health states or the provision of local health and hospital services, are included in the valuation. Because many of the value determinants differ between adults and children, assessing the quality of an adult-oriented study for purposes of valuing child health may differ from when valuing adult health.

Three nonmarket valuation methods typically have been used to estimate the value of health risks (cost of illness, contingent valuation, and averting behavior/household production).<sup>4</sup> Cost of illness studies are used frequently for health valuation, however this method is problematic for several reasons.<sup>5</sup> These issues notwithstanding, using the adult-oriented cost of illness studies to

estimate child-related values requires consideration of several child health-specific factors, for example:

- The course of health treatments for a child may differ from those of adults, resulting in differing costs (e.g., elderly individuals with kidney disease are less likely to receive a kidney transplant as a treatment option than would be young individuals with the disease). Similarly, the specialization in treatment required for children may be different for adults (e.g., pediatric oncology versus geriatric oncology).
- Adult-oriented cost of illness studies will not reflect the costs such as those associated with school or future losses in labor market earnings.
- Foregone earnings from adult illnesses may be different for child illnesses. For example, if the caregiver is a homemaker, a cost of illness study could overestimate costs in this category. However, if the caregiver works outside the home, the foregone earnings from the adult illness may be reflective of the foregone earnings resulting from spending time to care for their child.
- The length of the illness and expenditures incurred as a result of the duration of the illness may differ between children and adults.

When transferring adult-oriented values from studies using the contingent valuation methodology to estimate child health values, the issues of study quality are the same regardless of whether the value estimates are transferred for purposes of adult or child health valuation. In 1992, the National Oceanic and Atmospheric Administration commissioned a panel of economists and other experts to review the contingent valuation method and its application for measurement of values. The panel provided guidelines for conducting contingent valuation studies (DOC 1993). If the conditions for conducting these studies are met, the question of study suitability rests on study applicability and whether the commodity is well characterized.

Transferring values from adult-oriented studies of averted behavior for children requires that the analyst assess whether the steps taken to avoid a child-related health effect differ from those that would be taken to avoid an adult-related health effect. For example, while adults might decide to reduce their risk for heart disease and remain generally healthy by consuming less fat in their diet, children may require certain quantities of fat to remain healthy. The preferred outcome is the same in both cases, but the behavior differs between adults and children. Another example is one of safety

in cars - young children require car seats, an expense not included as part of an adult-oriented averted behavior study. In other cases, adults and children may undertake the same behavior to avoid the same health effect. For example, both adults and children may purchase and wear bicycle helmets to avoid injury.

## **Applicability**

Applicability concerns whether available studies involve health effects and populations similar to the policy case, and whether adjustments can be made for important differences. For any type of health-related benefits transfer, similarity can be assessed by describing the health effects, impacts on well-being, and affected population in a manner parallel to the description of the policy. A careful comparison of the descriptions of the study and the policy case will reveal the characteristics which are similar, and the nature and extent of differences. When transferring benefits for children's health valuation, there will be some important differences in the health effects or populations of the available adult-oriented studies versus those relevant to the policy case. Three elements to consider when assessing the comparability of the study case to the policy case include:

1. Whether the basic commodities of the policy and study cases are equivalent.
2. Whether the baseline criteria (i.e., quantity and quality) and extent of change are similar between the policy and study cases.
3. Similarity between the study and policy case populations.

While the last of the above three criteria raises the issue of similarity between adult and children populations directly, the first two criteria must also take this consideration into account. The basic commodities of the policy and study cases may appear to be equivalent for adult and child health valuation, but the analyst must be sure to address fundamental health effect differences that may exist between adults and children. Specifically, poor environmental health conditions may have different health outcomes on children than adults, regardless of any mitigating behavior that may be undertaken. Children may be more (or less) susceptible to health impacts from certain environmental

conditions than adults (e.g., lead impacts are more serious for children than adults, air pollution impacts may be more severe for the elderly than for children). Similarly, while the baseline criteria and extent of change may represent one level of severity for adult populations, it may represent another level of severity for child populations. For example, there remain significant uncertainties that limit available information on dose-response relationships between environmental contaminants and childhood asthma (EPA 1998); however, there is significant scientific evidence that indicates children are more susceptible to adverse health effects caused by certain environmental contamination (EPA 1996). As a result, the analyst must be sure to investigate the potential differences in physical effects from contaminant exposure between children and adults for each policy case.

In addition, when assessing study applicability, the analyst must consider how risk may be incorporated into the existing studies and how that compares with the policy situation. For example, analysts must consider whether caregivers are taking measures to reduce risk (i.e., an *ex ante* behavior), or if they are attempting to lessen the effect on the child (i.e., an *ex post* behavior). Risk may enter into *ex ante* valuation studies as uncertainty about whether the effect will occur. In addition, in either *ex ante* or *ex post* studies, risk may involve the uncertainty about whether actions taken to mitigate the effect will be realized. In child's health valuation, it is important to consider how risk enters into the caregivers decision process, and how that compares with the risk described in the existing studies.

## **Transferring Estimates**

The final step in the benefits transfer technique is to transfer the valuation information from the studies to the policy case. In any benefits transfer this involves combining and applying estimates to the policy case; aggregating benefits to the relevant population; and considering the uncertainties and limitations of the procedure. At times, several relevant studies will be available, or a single study will provide different estimates of the same value based on different subsamples, assumptions, or estimation procedures. Although no benefits transfer protocol has been established when using the results from many studies, several techniques exist to transfer estimates (see, for example, Desvousges, et. al 1998). This section discusses the applicability of these different techniques to transfer adult-oriented values to children.

### **Point Estimates**

The point estimate approach involves taking the mean value (or range of values) from the study case and applying it directly to the policy case. It is rare that a policy case and study case will be identical when considering children's health values, thus this approach is most useful for conducting preliminary benefits estimation. Rather than directly using existing values, analysts will often adjust point estimates based on judged differences between the study and the policy cases. Judgments of this type should be based on economic theory, empirical evidence and experience (Brookshire and Neill 1992). When transferring adult health values for children, these judgments should account for differences in the determinants of values that may exist for adults and children. The point estimate approach is most appropriate for scoping and screening analyses (i.e., preliminary analyses to characterize the magnitude of the benefit estimate).

Existing benefits transfer applications of point estimates that value health effects have aimed to provide rough approximations of the monetary benefits of avoiding adverse health effects. For



example, the retrospective analysis of the Clean Air Act (CAA) estimates the value associated with reducing child lead exposure (EPA 1997). A major effect of certain elevated lead exposures is permanently impaired cognitive development in children, however, at the time of the study, few estimates of society's WTP for improved cognitive ability were currently available. One recent effort includes parental WTP for investment in child cognitive development (Agee and Crocker, forthcoming). As a result, the CAA analysis estimates values for two effects of IQ decrements (i.e., reductions in expected lifetime income and increases in societal expenditures for compensatory education) using existing studies. The effect of IQ on expected lifetime income comprises a direct (the effect of IQ on income) and an indirect (the effect of educational attainment on income) effect. In addition, the analysis assumes that part-time compensatory education is required for all children with IQ less than 70. For these benefit categories, this analysis identifies and reviews several studies for the transfer, and adjusts point estimates based on economic theory, empirical evidence, and professional judgment. The result is that the analytic approach almost certainly understates the WTP to avoid impaired cognitive development in children, and, as stated in the analysis, probably should be considered a lower bound estimate.

### **Benefits Function Transfer**

Another approach for transferring value estimates is benefit function transfer. If a study case provides a willingness to pay function, valuation estimates can be updated by substituting applicable values of key variables, such as baseline risk and population characteristics (e.g., mean or median income, racial or age distribution) from the policy case into the benefit function. This approach has received mixed reviews in the literature. Kirchhoff, et. al (1997) develop a methodology for testing the validity of benefits transfer for water-dependent recreation and reject using the (mean) point estimate technique for transfer, preferring the benefits function transfer approach. By comparing the transfer estimates to the site-specific estimates, the study rejects the validity of the point estimate transfer, and cannot reject the validity of the benefits function transfer. However, Downing and

Ozuna (1996) test the benefits function transfer approach for transferring fishing values. The results indicate that the benefit function transfer approach overestimates benefits, and as a result the authors find this approach “unreliable” in the case they considered. Without similar empirical research, it is difficult to determine which would be the case for health valuation, either for adult-adult health value transfers or adult-child health value transfers.

The relevant factor to consider in the case of children’s health is whether the characteristics of the policy case (i.e., characteristics specific to children) are significantly different from the characteristics of the adult study sample. As Loomis (1992) notes, the validity of transferring a benefit function relies, in part, on the equality of the coefficients of the study case with those of the policy case (if such a function were to exist to describe the policy case). In this case, the existing parameter estimates of the adult-oriented valuation model would only be peripherally useful for valuing children’s health effects. Crucial valuation elements, such as intertemporal effects, duration, and altruism may play a significant role in children’s health values that may not be represented in existing models of adult valuation. As a result, the child-specific factors omitted from the adult-oriented model have the effect of biasing the estimated coefficients for purposes of benefits transfer.

## **Meta Analysis**

A more rigorous benefits transfer exercise uses meta analysis. Meta analysis is a statistical method of combining a number of valuation estimates that allow the analyst to systematically explore variation in existing value estimates across studies. As with the benefit function transfer approach, key variables from the policy case are inserted into the resulting benefit function. As discussed in detail in Desvousges, et. al (1998), there are several types of meta analysis models. This technique requires analysts to systematically document the assumptions of the underlying studies, thus leading to a greater understanding of the differences among value estimates.

For example, Desvousges, et. al (1998) provide a benefits transfer case study utilizing the technique of meta analysis. The authors construct a meta analysis model for short-term morbidity effects associated with pollution resulting from electricity generation. Because much of the existing literature on short-term morbidity effects measure values for a number of different, closely related health effects, the authors use the meta analysis approach in combination with an index for “health-state” to enable simultaneous consideration of these studies. The case study uses WTP for short-term health effects from five contingent valuation studies that value 221 health conditions. The model explains WTP values as a function of the health index, and variables describing the number of illness days. This study is most useful for adult-oriented values and does not include demographic variables that might be useful if the underlying studies included younger populations.

Meta analysis is possible when a number of health-related values exist. If analysts are considering transferring a number of adult-oriented values to estimate the child-related benefits of a policy case, they must recognize that the meta analysis will be limited to explaining the variation among the adult-oriented values. To the extent that child-related values are of a fundamentally different composition from adult-oriented values, meta analysis will fail to account for these shortcomings. For example, in some cases child-oriented models may have different determinants of value than adult-oriented values (e.g., caregiver empathy), and in other cases, the determinants of value may be significantly different between the two models (e.g., the effect of latency or health effect duration). In either case, a meta analysis model will not be able to account for these differences.

## Bayesian Techniques

An alternative to the meta analytic approach for summarizing the results of several studies is the Bayesian approach. Empirical Bayes techniques provide a systematic way to incorporate existing study (i.e., prior) information with policy case (i.e., sample) information to estimate a value for transfer.<sup>6</sup> The analyst assesses the extent to which transferability from existing studies to a policy case is appropriate by assessing the correspondence between the range of estimates provided by existing studies (e.g., child health values, determinants of child health values) and a particular level of uncertainty the analyst is willing to accept (i.e., a given confidence interval). Based on the results of this comparison, the analyst can determine whether it is reasonable to incur costs to conduct a new study. If in the use of this technique the analyst is more concerned about reducing the possibility of understating value estimates (i.e., avoidance of a downside risk), the accuracy of the existing study information plays a greater role in this comparison. In this case, analysts must consider obtaining more accurate existing study information, or improved information on the policy case (i.e., better sample information). As noted above, obtaining accurate existing study information for valuation of children's health is difficult.

To the extent that child health values are generated similarly to adult health values, this technique holds promise. However, given the few studies of child health values and complexity in determining these values, it is not clear how to specify estimates of children's health values, or how they may differ from those of adults. As stated above, this element of the analysis can play a major role in the results of empirical Bayes techniques. Nevertheless, Kask and Shogren (1993) discuss the potential importance of using the Bayesian framework to understand health values. In particular, the authors note that this technique could be used to investigate how health risk reduction strategies could influence health values. It is worth noting that this issue becomes even more relevant when valuing children's health because the mitigating actions of the caregivers add a layer of complexity to the link between risk reduction and value.

## IMPLICATIONS

Previous analyses of recreational behavior suggest that results from benefits transfers must be interpreted with caution (e.g., Smith 1992, Loomis 1992). While these studies are not specific to health valuation, they suggest that benefits transfers should be conducted and interpreted with careful consideration of potential sources of inaccuracy or imprecision. At the same time, however, inaccuracy and imprecision must also be considered in comparison to the uncertainty that might arise in conducting incomplete primary research.<sup>7</sup> In some cases, benefits transfer may be a more comprehensive estimate than a new cost of illness study, while in others it may be no more appropriate to conduct a benefits transfer exercise than it would be to conduct a new cost of illness study. Depending on the policy case, analysts must consider how different adult-oriented values will be from those of children, and which uncertainties are the greatest.<sup>8</sup>

This detailed assessment of using the benefits transfer technique to estimate children's health values from adult-oriented studies indicates that there are currently significant uncertainties in reliably transferring values to children.

- The literature of child-oriented health values is not extensive, and the majority of these studies were conducted using the less-preferred cost of illness approach. The sparseness of the existing literature makes it difficult to gauge to what degree adult-oriented health values reflect child-oriented health values. As a result, there is no clear guidance for making factor adjustments from adults to children in the transfer process.
- Having to rely on adult-oriented studies to estimate child-oriented values results in transfers that may not adequately account for important child-related characteristics affecting values. For example, areas of inaccuracy between the two contexts involve differences in the:
  - ▶ Health effect measurement (e.g., perception of adversity, additional child behavioral responses, measurement certainty);
  - ▶ Health effect characteristics (e.g., risk perception, severity, duration, latency, susceptibility);

- ▶ Impact on well-being and determinants of value (e.g., caregiver altruism, parental motivation for future care, future productivity); and
- ▶ Population characteristics (e.g., age, health status, education level).

Because the structure of the value determinants appears to be quite different between adults and children (e.g., public empathy), it is difficult to know how values will differ between the two situations. Analysts must account for policy-specific characteristics, characteristics of health outcomes, and mitigating behavior that may differ between adults and children in order to make appropriate transfers.

- The techniques available to transfer benefit estimates from adults to children each hinge upon analysts having some understanding of how child-related values compare to those of adults. Adjustments made using any of the available techniques require prior information on economic theory, empirical evidence, and experience. However, because children's health values have been studied infrequently, it is currently difficult to make adjustments with a given level of confidence.

The current practice of using benefits transfer to estimate rough approximations of the monetary benefits of avoiding adverse health effects appears to be on target for children's health values. However, because it may be important for some policy analyses to more accurately estimate children's health values, analysts should weigh the potential benefits of conducting primary research against the costs of uncertainty. In particular, in cases where the rough approximations of children's health values indicate that this category of benefits may be a crucial component in the policy analysis, it may be prudent to undertake additional primary research to estimate child-related values.

In addition, it may be useful to conduct more general research that systematically explains linkages between adults and children. Such an effort could serve as a common foundation for conducting primary research or identifying important considerations in benefits transfer. In particular, studies of the health-related tradeoffs that adults make may be informative to this question. There may be useful information on children's health values that could be obtained from a study of the tradeoffs that caregivers make about their own and their child's health versus tradeoffs that adults without children make about their own health. One possibility is to consider health studies that allow an analysis of the marginal willingness to pay as a function of the presence of number of children in

a household. Studies in other disciplines or areas of economics (e.g., labor economics) may provide some insight. In addition, this research could include a more formal investigation of whether existing adult valuations provide insight into the relative size and importance of children's health valuation determinants for comparable effects.

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## ENDNOTES

1.

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2.

The techniques of benefits transfer have been used for many years to evaluate public policy options and to assess natural resource damages. Benefits transfer is often used when insufficient time or money is available to gather the primary data required for a new valuation study. Typical steps involved in conducting a benefits transfer have been discussed in the existing literature, including EPA's draft handbook for non-cancer valuation (1998) and Desvousges, et. al (1998). Although no established protocol currently exists to conduct a benefits transfer, steps to follow likely include:

1. Describing the policy case in detail.
2. Identifying existing, relevant studies.
3. Evaluating the suitability of the studies for benefits transfer. This step concerns assessing the quality and applicability of identified studies.
4. Transferring the benefits to the policy case. This step includes determining the extent of the market for the benefits transfer (i.e., the number of persons affected by the policy), and describing the uncertainty associated with these estimates.

3.

A variety of studies have discussed benefits transfer and the issues that may arise as a result of employing this technique for policy analysis. For example:

- Desvousges, et. al (1998) discuss the transfer technique more broadly than just for benefits transfer purposes. The authors define transfer as the "use of existing information designed for one specific context to address policy questions in another context" (p. 4), and assess the usefulness of this method for a number of linkages in the overall process. For example, transfer methods may be used when describing the physical effects of a policy (e.g., level of air emissions) as well as the behavioral effects that have value implications. The authors illustrate the transfer method with a health-related case study, considering the short-term morbidity effects, chronic morbidity effects, and mortality risks associated with pollution resulting from electricity generation, and employ simulation techniques to estimate "most likely" health values associated with adult populations.
- Kask and Shogren (1993) discuss the benefits transfer protocol for long-term health risk reduction, and provide a case study for surface water contamination. The authors note significant challenges in overcoming the limitations of using secondary research to value health effects for policy. The authors indicate that the most significant limitations include matching the commodity to be valued associated with the policy case to the set of existing valuation studies; and understanding the relationship between how a health risk is reduced and what health risk actually is reduced. The challenges in overcoming these limitations arise from the multiple sources of risk, multi-symptomatic effects, the latency period between cause and health effect, and the individual's ability (privately or collectively) to reduce risk.
- A special issue of *Water Resources Research* (1992) is dedicated to the topic of benefits transfer. The papers in this issue investigate a variety of conceptual and empirical issues associated with the benefits transfer technique, without specific

application. The papers presented in this journal issue were prepared for the 1992 workshop of the Association of Environmental and Resource Economists on benefits transfer issues.

4.

Hedonic methods (wage or property studies) represent another valuation technique less preferred than the three methods mentioned above. With this method, theoretically it is difficult to distinguish the contribution that environmental quality makes to health (children or adults) for a given policy from the other beneficial contributions that environmental quality may make to an individual. For example, the implicit price of better air quality at a site may reflect the value of less soiling, less odor, or better visibility as well as the value of better health. In practice, it is difficult to isolate the marginal WTP for health from the values of other characteristics, including the contribution that environmental quality makes to the child's caregivers.

5.

The theoretical basis of the cost of illness method is quite limited — the method does not measure WTP for reduced health effects. In addition, cost of illness does not reflect the amount that will actually be expended, rather this cost represents what could be spent. It is also important to recognize that because treatments for illness change over time, the cost of illness is a dynamic concept. Older cost of illness studies may not account for changes in medical technology that might alter the cost or effectiveness of treatment.

6.

Studies that have explored these empirical Bayes concepts include Du Mouchel and Harris (1983), Atkinson, et al. (1992), and Atkinson and Crocker (1992).

7.

The empirical Bayes technique may provide the analyst with a systematic way to consider this tradeoff.

8.

In view of the likely tradeoff between the convenience of benefits transfer and the reliability of the resulting benefit estimates, the question of whether to apply benefits transfer may be best considered within the context of the policy and the options available for assessing benefits. Factors worth considering include: the accuracy required of the resulting estimate; the availability of relevant existing studies; the degree to which additional primary research would improve the accuracy or reduce the uncertainty of the resulting benefit estimate; and the time and financial resources available to conduct the analysis (Atkinson, Crocker and Shogren 1992).